

Proposed Nevada Mercury Air Emissions Control Program

APPENDIX 2

MONITORING, TESTING RECORD KEEPING AND REPORTING

INTRODUCTION

As part of the Nevada Mercury Air Emissions Control Program (NMCP), monitoring, testing, record keeping and reporting is being established to improve the program over its predecessor (Voluntary Mercury Reduction Program). This document includes a page for each type of thermal source of mercury that has been part of the VMRP. For each source type there is a description of how the source and its controls work and then a listing of the monitoring, testing, record keeping and reporting that would become part of the NMCP. Controls described herein include the Presumptive MACT controls. In some cases controls may apply to more than one type of mercury source. For example, a furnace and an electro-winning cell may both report to a common control device. Monitoring, testing, record keeping and reporting described herein would be applied to Tier 1 sources. NDEP will determine the appropriate monitoring, testing, record keeping and reporting for Tier 2 sources with reference to specifics herein but with consideration for mercury emissions and other factors.

Thermal Sources addressed include:

- Retorts
- Carbon Kilns
- Roasters
- Roaster Pre-heaters
- Autoclaves
- Electro-winning cells and associated tanks
- Furnaces

A tab has also been created for chemical treatment to be carried out in lieu of or in addition to controls.

In addition to the reporting described herein, total mercury pounds shipped from a facility for refining and sale would be reported annually.

MONITORING, TESTING RECORD KEEPING AND REPORTING

MERCURY RETORTS

Mercury retorts are utilized to recover mercury from the gold/silver/mercury filter cake and to dry the cake. They operate by placing the wet filter cake in open containers and then placing the containers in the retort. The retort is then bolted shut. It is then slowly heated to approximately 1100° F over a 12-16 hour or longer period. The retort is operated under a vacuum. It is kept sealed while a small amount of air is allowed into the retort on a periodic basis to provide for mercury-laden gas and water vapor to exit the retort and flow to the collection devices. Collection is done through scrubbing with water (in some cases chilled). Gas then reports to filters that contain activated carbon that has an affinity for mercury. Mercury not condensed in the scrubber will be captured in the carbon filter. Condensed mercury is accumulated, packaged in appropriate containers and shipped to a refinery. Activated carbon is removed and replaced periodically.

Operating and Maintenance Plans: Operating and maintenance plans will be submitted to NDEP regarding the operation of the mercury retorts and mercury recovery/control equipment. These plans will incorporate monitoring, record keeping and testing as described herein. Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.

Retorts: Daily hours of operations. Maintain records on site.
Daily temperature logs. Maintain records on site.

Condensers: Daily water temperature. Maintain records on site.
Daily pressure drop. Maintain records on site.

Carbon Filters: Each operation will develop a carbon change out plan based on variables such as mercury production, filter efficiency, mercury, loadings on carbon, carbon capacity for mercury, gas flow rates, and mercury concentrations in the gas. These plans will be designed to insure that the carbon is changed before “breakthrough”. These plans will be submitted to NDEP. A carbon change out log including date and pounds will be maintained on site.

Testing: Source testing will be carried out annually pursuant to an approved testing protocol.
A reduction in the testing frequency may be requested after 3-5 years of data gathering.

Annual Emissions, Evaluation and Reporting: Mercury emissions from this source will be reported annually to NDEP.
An evaluation of annual operations and data collected will also be provided.

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CARBON KILNS

Carbon kilns are operated to heat up and reactivate the carbon to improve its affinity for recovery of gold, silver and mercury. Carbon is reactivated after gold, silver and mercury has been stripped from the carbon. Nonetheless, some mercury remains on the carbon after stripping. During regeneration, the carbon is heated to approximately 1300° F during which time any residual mercury can vaporize and then be captured in wet scrubbers and/or carbon filters. Activated carbon is removed and replaced periodically.

Operating and Maintenance Plans: Operating and maintenance plans will be submitted to NDEP regarding the operation of the carbon kiln(s) and mercury recovery/control equipment. These plans will incorporate monitoring, record keeping and testing as described herein. Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.

Kiln: Daily hours of operation. Maintain records on site.
Daily temperature logs. Maintain records on site.
Daily tonnage throughput. Maintain records on site.

Wet Scrubber: Daily water temperature. Maintain records on site.
Daily pressure drop. Maintain records on site.
Record hypochlorite concentration where appropriate.

Carbon Filters: Each operation will develop a carbon change out plan based on variables such as mercury production, filter efficiency, mercury, loadings on carbon, carbon capacity for mercury, gas flow rates, and mercury concentrations in the gas. These plans will be designed to insure that the carbon is changed before “breakthrough”. These plans will be submitted to NDEP. A carbon change out log including date and pounds will be maintained on site.

Testing: Source testing will be carried out annually pursuant to an approved testing protocol.
A reduction in the testing frequency may be requested after 3-5 years of data gathering.

Annual Emissions, Evaluation and Reporting: Mercury emissions from this source will be reported annually to NDEP.
An evaluation of annual operations and data collected will also be provided.

MONITORING, TESTING RECORD KEEPING AND REPORTING

ROASTERS

Roasters are operated to pre-treat gold ore or concentrates to make the ore amenable to cyanide leaching. In the roasting process ore is heated to 1000° F or more. Gases from the ore roasting are cleaned using a number of processes including dry electrostatic precipitation (ESP), wet ESP, wet scrubbing, bag houses, sulfuric acid plants, carbon monoxide converters and calomel scrubbers. Mercury removal is carried out primarily in calomel scrubbers or hypochlorite scrubbers but many of the aforementioned gas cleaning devices will remove mercury.

Operating and Maintenance Plans:	Operating and maintenance plans will be submitted to NDEP regarding the operation of the roaster and mercury recovery control equipment. These plans will incorporate monitoring, record keeping and testing as described herein. Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.
Wet ESP:	Monitoring of variables such as primary and secondary voltage will be carried out per the manufacturer's recommendations.
Wet Scrubber:	Daily hours of operation. Maintain records on site. Daily temperature logs. Maintain records on site. Daily hypochlorite concentration (where used). Maintain records on site.
Calomel Scrubber:	Daily mercurous chloride concentration (where used) and pressure drop. Maintain records on site.
Testing:	Source testing will be carried out annually pursuant to an approved testing protocol. A reduction in the testing frequency may be requested after 3-5 years of data gathering.
Annual Emissions, Evaluation and Reporting:	Mercury emissions from this source will be reported annually to NDEP. An evaluation of annual operations and data collected will also be provided.

MONITORING, TESTING RECORD KEEPING AND REPORTING

ROASTER PRE-HEATERS

Roasters are operated to pre-treat gold ore or concentrates to make the ore amenable to cyanide leaching. In the roasting process ore is heated up to 1000° F or more. At least one roasting operation utilizes pre-heating as an energy saving step to partially heat the ore. Some mercury can be vaporized at this point in the process. Mercury removal is carried out with a wet scrubber.

Operating and Maintenance Plans: Operating and maintenance plans will be submitted to NDEP regarding the operation of the roaster pre-heater and mercury recovery/control equipment. These plans will incorporate monitoring, record keeping and testing as described herein. Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.

Wet Scrubber: Daily hours of operation. Maintain records on site.
Daily temperature logs. Maintain records on site.
Daily pressure drop. Maintain records on site.
Daily pH measurements. Maintain records on site.

Testing: Source testing will be carried out annually pursuant to an approved testing protocol. A reduction in the testing frequency may be requested after 3-5 years of data gathering.

Annual Emissions, Evaluation and Reporting: Mercury emissions from this source will be reported annually to NDEP. An evaluation of annual operations and data collected will also be provided.

MONITORING, TESTING RECORD KEEPING AND REPORTING

AUTOCLAVES

Autoclaves are operated to pre-treat gold ore or concentrates to make the ore amenable to cyanide leaching. In the autoclaving process ore is heated to approximately 440°F under pressure in a slurry form. After autoclaving the slurry is cooled and gases are vented through venture scrubbers and then to atmosphere. While most of the mercury remains in a solid form during autoclaving, some can vaporize and flow in a gas form to the scrubber.

Operating and Maintenance Plans: Operating and maintenance plans will be submitted to NDEP regarding the operation of the autoclave and mercury recovery/control equipment. These plans will incorporate monitoring, record keeping and testing as described herein. Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.

Venturi Scrubber: Daily hours of operation. Maintain records on site.
Daily water flow rates. Maintain records on site.
Daily pressure drop. Maintain records on site.

Testing: Source testing will be carried out annually pursuant to an approved testing protocol.
A reduction in the testing frequency may be requested after 3-5 years of data gathering.

Annual Emissions, Evaluation and Reporting: Mercury emissions from this source will be reported annually to NDEP.
An evaluation of annual operations and data collected will also be provided.

MONITORING, TESTING RECORD KEEPING AND REPORTING

ELECTRO-WINNING, PREG AND BARREN TANKS

Electro-winning involves the recovery of gold, silver and mercury from solution using cathodes, anodes and Direct Current. Because the solution is between 100° F and 200° F, some mercury can vaporize from solution and exit as a gas. Therefore, some operations utilize carbon filters for mercury removal. Activated carbon is removed and replaced periodically.

Operating and Maintenance Plans: Operating and maintenance plans will be submitted to NDEP regarding the operation of the electro-winning system and mercury recovery/control equipment. These plans will incorporate monitoring, record keeping testing as described herein.

Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.

Carbon Filter: Each operation will develop a carbon change out plan based on variables such as mercury production, filter efficiency, mercury, loadings on carbon, carbon capacity for mercury, gas flow rates, and mercury concentrations in the gas. These plans will be designed to insure that the carbon is changed before “breakthrough”. These plans will be submitted to NDEP. A carbon change out log including date and pounds will be maintained on site.

Testing: Source testing will be carried out annually pursuant to an approved testing protocol. A reduction in the testing frequency may be requested after 3-5 years of data gathering.

Annual Emissions, Evaluation and Reporting: Mercury emissions from this source will be reported annually to NDEP. An evaluation of annual operations and data collected will also be provided.

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FURNACES

Following retorting filter cake containing gold and silver is mixed with fluxes and melted at approximately 2400° F. This filter cake should contain little to no mercury due to its removal and recovery in the retorts. Nonetheless, some operations utilize a carbon filter or a wet scrubber to capture any mercury that may occur in the vent gas from the melting process. Activated carbon is removed and replaced periodically.

Operating and Maintenance Plans: Operating and maintenance plans will be submitted to NDEP regarding the operation of the smelting furnaces and mercury recovery/control equipment. These plans will incorporate monitoring, record keeping and testing as described herein. Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.

Wet Scrubber: Daily water temperature. Maintain records on site.
Daily pressure drop. Maintain records on site.

Carbon Filter: Each operation will develop a carbon change out plan based on variables such as mercury production, filter efficiency, mercury, loadings on carbon, carbon capacity for mercury, gas flow rates, and mercury concentrations in the gas. These plans will be designed to insure that the carbon is changed before “breakthrough”. These plans will be submitted to NDEP. A carbon change out log including date and pounds will be maintained on site.

Testing: Source testing will be carried out annually pursuant to an approved testing protocol.
A reduction in the testing frequency may be requested after 3-5 years of data gathering.

Annual Emissions, Evaluation and Reporting: Mercury emissions from this source will be reported annually to NDEP.
An evaluation of annual operations and data collected will also be provided.

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CHEMICAL TREATMENT

During the gold and silver leaching process, the leaching reagent, sodium cyanide, will also dissolve some of the mercury from the ore. Some operations utilize chemical treatment of process solutions and slurries resulting in the formation of a mercury sulfide in solid form. Chemical treatment in some cases can be effective such that mercury removal is not necessary at subsequent thermal processing units such as Carbon Kilns.

Operating and Maintenance Plans: Operating and maintenance plans will be submitted to NDEP regarding the operation of the gold recovery Processes and mercury treatment processes. These plans will incorporate monitoring, record keeping and testing as described herein. Maintenance Plans will also include a description of the preventative maintenance programs including the frequency for any replacement of wear parts and or components.

Chemical Treatment: Calculations as to mercury in process and chemical addition rates. Maintain records on site. Monthly tests for mercury concentrations in process solution and/or slurry. Maintain records on site. Monthly dosage rates and types of chemicals used. Maintain records on site.

Testing: Source testing will be carried out annually at the appropriate thermal process unit(s) pursuant to an approved testing protocol. A reduction in the testing frequency may be requested after 3-5 years of data gathering.

Annual Emissions Reporting: Mercury emissions from this source will be reported annually to NDEP.